IN THE SPECIFICATION

ON PAGE 7, IN THE PARAGRAPH BEGINNING AT LINE 14, PLEASE ENTER THE FOLLOWING AMENDMENTS:

A disclosed invention method of segmentally modeling real and imaginary parts of dielectric functions with Kramers-Kronig (K-K) consistency, then comprises the steps of:

a) providing an imaginary part of a dielectric function and dividing it into a plurality of ~~segements~~ segments;

b) fitting each ~~segement~~ segment with an appropriate approximating K-K consistent mathematical construction, the mathematical constructions being continuous at intersection between adjacent ~~segements~~ segments, each mathematical construction comprising a selection from the group consisting of:

a mathematical equation; and
a summation of oscillator structures.

Where a mathematical equation is fit to the imaginary imaginary part of a dielectric function it can be of a polynomial form of degree (n-1), where (n) is sum of the number of intersections between ~~segements~~ segments plus a beginning and an end node. It is disclosed, however, that the technique of fitting the imaginary part of a Dielectric Function with a polynomial of degree one less than the number of points being fit, (eg. a Cubic Spline as discussed in "Applied Numerical Methods for Digital Computation", James et al., Harper Row (1985)), is known, followed by applying a K-K Integration to provide the real part of the Dielectric Function. In contrast, the disclosed invention

provides a separate mathematical construction for each ~~segement~~ <u>segment</u> between identified points.

<u>ON PAGE 8, IN THE PARAGRAPH BEGINNING AT LINE 10, PLEASE ENTER THE FOLLOWING AMENDMENTS:</u>

A more relevant presently disclosed method of segmentally modeling real and imaginary parts of dielectric functions with Kramers-Kronig (K-K) consistency, then comprising the steps of:

a) providing an imaginary part of a dielectric function over spectroscopic range, and dividing said spectroscopic range into a plurality of ~~segements~~ <u>segments</u>;

b) fitting each said ~~segement~~ <u>segment</u> in said spectroscopic range with an approximating K-K consistent oscillator structure, said approximating oscillator structure in each said ~~segement~~ <u>segment</u> beginning and ending at the start and end of said respective ~~segement~~ <u>segment</u>, such that a summation of contributions from said oscillator structures present at each point within said spectroscopic range approximates said imaginary part of said dielectric function, and via Kramers-Kronig (K-K) consistency, also the real part of said dielectric function<u>.</u>

<u>ON PAGE 8, IN THE PARAGRAPH BEGINNING AT LINE 28, PLEASE ENTER THE FOLLOWING AMENDMENTS:</u>

A specific embodiment of said more relevant method provides that the ~~segements~~ <u>segments</u> are of equal spectroscopic range lengths and at least one of said K-K consistent oscillator structures is preferably triangular shaped; the start and end of all oscillator structures, except the start of the first and end of the last, being positioned at the same spectroscopic point as are peaks of

immediately adjacent oscillator structures.

ON PAGE 9, IN THE PARAGRAPH BEGINNING AT LINE 1, PLEASE ENTER THE FOLLOWING AMENDMENTS:

Another specific embodiment of said more relevant method provides that at least one ~~segement~~ segment in said spectroscopic range is of a different length than other ~~segements~~ segments in said spectroscopic range and at least one of said K-K consistent oscillator structures is preferably triangular shaped; the start and end of all oscillator structures, except the start of the first and end of the last, being positioned at the same spectroscopic points as are peaks of immediately adjacent oscillator structures.

BEGINNING ON PAGE 9, IN THE PARAGRAPH BEGINNING AT LINE 10, PLEASE ENTER THE FOLLOWING AMENDMENTS:

A more detailed disclosure of a present invention method of seqmentally modeling real and imaginary parts of dielectric functions using Kramers-Kronig (K-K) consistent oscillators, comprises the steps of:

practicing steps a and b ~~in either order;~~:

a) providing experimentally obtained data for real and imaginary parts of a dielectric function vs. wavelength for a sample comprising a transparent thin film on a substrate, over a determined range of wavelengths;

b) providing a mathematical model of said sample which comprises a parameter coresponding to the thickness of the transparent thin film and comprises parameters corresponding to a pole amplitude and location at a wavelength beyond the lower

wavelength, high energy, extent of said determined range of wavelengths, then by a global fitting procedure evaluating parameters, including the thickness of the transparent thin film and the location and amplitude of the pole in said mathematical model, utilizing the data corresponding to the real part of the dielectric function;

with transparent thin film thickness evaluated in step b, proceeding to practice steps c, d and e sequentially:

c) defining a wavelength range ~~segement~~ segment length such that the sum of (n + 0.5) wavelength range ~~segements~~ segments exactly span the determined wavelength range, and beginning at one end of said determined wavelength range placing a (K-K) consistent oscillator which comprises an amplitude parameter and begins and ends at the extents of the first ~~segement~~ segment with its peak midway therebetween, then performing a point by point fit to the imaginary part of the dielectric function data over wavelengths in said first wavelength range ~~segement~~ segment such that (K-K) consistent oscillator defining parameters are evaluated;

d) placing a second (K-K) consistent oscillator which begins at a wavelength at which the first (K-K) consistent oscillator peaks and ends one wavelength range ~~segement~~ segment length therefrom and has a peak midway therebetween, then performing a point by point fit to the imaginary part of the dielectric function data over said first and second wavelength range ~~segements~~ segments such that (K-K) consistent oscillator defining parameters in said first (K-K) consistent oscillator are re-evaluated and oscillator defining parameters in said second (K-K) consistent oscillator are evaluated;

for each of the remaining (n - 2) wavelength range ~~segements~~ segments, sequentially;

e) placing a (K-K) consistent oscillator which begins at a wavelength at which the just prior (K-K) consistent oscillator peaks and ends one wavelength range ~~segement~~ segment length therefrom and having a peak midway therebetween, then performing a point by point fit to the imaginary part of the dielectric function data over said wavelength range ~~segements~~ segments which are fitted with (K-K) consistent oscillators, such that oscillator defining parameters in previously evaluated (K-K) consistent oscillators are re-evaluated and oscillator defining parameters in the added oscillator are evaluated;

such that at each wavelength over the determined range of wavelengths the sum of the contributions of each evaluated (K-K) consistent oscillator approximates the magnitude of the imaginary part of the dielectric function.

ON PAGE 11, IN THE PARAGRAPH BEGINNING AT LINE 10, PLEASE ENTER THE FOLLOWING AMENDMENTS:

The just recited method assumes use of equal length wavelength range ~~segements~~ segments, but said method of ~~segementally~~ segmentally modeling real and imaginary parts of dielectric functions with Kramers-Kronig (K-K) consistent oscillators could involve utilizing variable length wavelength range ~~segements~~ segments, and comprise the steps of:

practicing steps a and b ~~in either order;~~:

a) providing experimentally obtained data for real and imaginary parts of a dielectric function vs. wavelength for a sample comprising a transparent thin film on a substrate, over a

determined range of wavelengths;

b) providing a mathematical model of said sample which comprises a parameter coresponding to the thickness of the transparent thin film and comprises parameters corresponding to a pole amplitude and location at a wavelength beyond the lower wavelength, high energy, extent of said determined range of wavelengths, then by a global fitting procedure evaluating parameters, including the thickness of the transparent thin film and the location and amplitude of the pole in said mathematical model, utilizing the data corresponding to the real part of the dielectric function;

with transparent thin film thickness evaluated in step b, proceeding to practice steps c, d and e sequentially:

c) defining n wavelength range ~~segement~~ segment lengths such that the sum of said n wavelength range ~~segements~~ segments plus half the length of the last wavelength range ~~segement~~ segment at one end of said wavelength range exactly spans the determined wavelength range, and beginning at the opposite end of said determined wavelength range placing a (K-K) consistent oscillator which comprises an amplitude parameter and begins and ends at the extents of the first ~~segement~~ segment with its peak midway therebetween, then performing a point by point fit to the imaginary part of the dielectric function data over wavelengths in said first wavelength range ~~segement~~ segment such that (K-K) consistent oscillator defining parameters are evaluated;

d) placing a second (K-K) consistent oscillator which begins at a wavelength at which the first (K-K) consistent oscillator peaks and ends the second wavelength range ~~segement~~ segment length therefrom and has a peak midway therebetween, then performing a point by point fit to the imaginary part of the dielectric

function data over said first and second wavelength range ~~segements~~ segments such that (K-K) consistent oscillator defining parameters in said first (K-K) consistent oscillator are re-evaluated and oscillator defining parameters in said second (K-K) consistent oscillator are evaluated;

for each of the remaining (n - 2) wavelength range ~~segements~~ segments, sequentially;

e) placing a (K-K) consistent oscillator which begins at a wavelength at which the just prior (K-K) consistent oscillator peaks and ends at the nth wavelength range ~~segement~~ segment length therefrom and having a peak midway therebetween, then performing a point by point fit to the imaginary part of the dielectric function data over said wavelength range ~~segements~~ segments which are fitted with (K-K) consistent oscillators, such that oscillator defining parameters in previously evaluated (K-K) consistent oscillators are re-evaluated and oscillator defining parameters in the added oscillator are evaluated;

such that at each wavelength over the determined range of wavelengths the sum of the contributions of each evaluated (K-K) consistent oscillator approximates the magnitude of the imaginary part of the dielectric function.

ON PAGE 14, IN THE PARAGRAPH BEGINNING AT LINE 16, PLEASE ENTER THE FOLLOWING AMENDMENTS:

In addition, said method, for each of the "n" the wavelength range ~~segements~~ segments, can involve letting the ~~segement~~ segment length thereof float and be fit along with other (K-K) consistent oscillator parameters.

ON PAGE 14, IN THE PARAGRAPH BEGINNING AT LINE 24, PLEASE ENTER

THE FOLLOWING AMENDMENTS:

A modified method of ~~segementally~~ segmentally modeling real and imaginary parts of dielectric functions with Kramers-Kronig (K-K) consistent oscillators, comprises the steps of:

practicing steps a and b ~~in either order;~~:

a) providing experimentally obtained data for real and imaginary parts of a dielectric function vs. wavelength for a sample comprising a transparent thin film on a substrate, over a determined range of wavelengths;

b) providing a mathematical model of said sample which comprises a parameter coresponding to the thickness of the transparent thin film and comprises parameters corresponding to a pole amplitude and location at a wavelength beyond the lower wavelength, high energy, extent of said determined range of wavelengths, then by a fitting procedure evaluating parameters, including the thickness of the transparent thin film and the location and amplitude of the pole in said mathematical model, utilizing the data corresponding to the real part of the dielectric function.

With transparent thin film thickness evaluated in step b, said modified method then proceeds to with steps c, d and e sequentially:

c) defining a wavelength range ~~segement~~ segment length such that the sum of (n) wavelength range ~~segements~~ segments exactly span the determined wavelength range, and beginning centrally in said determined wavelength range placing a first (K-K) consistent oscillator which comprises an amplitude parameter and begins and

ends at the extents of the first ~~segement~~ segment with it's peak midway therebetween;

for each of the remaining (n - 1) wavelength range ~~segements~~ segments, on ether side of the central peak of the first (K-K) consistent oscillator;

d) placing a (K-K) consistent oscillator which begins at a wavelength at which the just centrally prior (K-K) consistent oscillator peaks and ends one wavelength range ~~segement~~ segment length therefrom and having a peak midway therebetween;

e) performing a fit to the imaginary part of the dielectric function data over said wavelength range ~~segements~~ segments which are fitted with (K-K) consistent oscillators, such that oscillator defining parameters in the (K-K) consistent oscillators are evaluated;

such that at each wavelength over the determined range of wavelengths the sum of the contributions of each evaluated (K-K) consistent oscillator approximates the magnitude of the imaginary part of the dielectric function.

ON PAGE 16, IN THE PARAGRAPH BEGINNING AT LINE 10, PLEASE ENTER THE FOLLOWING AMENDMENTS:

The just recited modified method assumes that the wavelength range ~~segement~~ segment lengths are equal. Another modified method of ~~segementally~~ segmentally modeling real and imaginary parts of dielectric functions with Kramers-Kronig (K-K) consistent oscillators allows for the wavelength range ~~segements~~ segments to vary, and comprises the steps of:

practicing steps a and b ~~in-either-order;~~:

a) providing experimentally obtained data for real and imaginary parts of a dielectric function vs. wavelength for a sample comprising a transparent thin film on a substrate, over a determined range of wavelengths;

b) providing a mathematical model of said sample which comprises a parameter coresponding to the thickness of the transparent thin film and comprises parameters corresponding to a pole amplitude and location at a wavelength beyond the lower wavelength, high energy, extent of said determined range of wavelengths, then by a fitting procedure evaluating parameters, including the thickness of the transparent thin film and the location and amplitude of the pole in said mathematical model, utilizing the data corresponding to the real part of the dielectric function;

with transparent thin film thickness evaluated in step b, proceeding to practice steps c, d and e sequentially:

c) defining (n) wavelength range ~~segement~~ <u>segment</u> lengths such that the sum of said (n) wavelength range ~~segements~~ <u>segments</u> exactly span the determined wavelength range, and beginning centrally in said determined wavelength range placing a first (K-K) consistent oscillator which comprises an amplitude parameter and begins and ends at the extents of the first ~~segement~~ <u>segment</u> with its peak midway therebetween;

for each of the remaining (n - 1) wavelength range ~~segements~~ <u>segments</u>, on ether side of the central peak of the first (K-K) consistent oscillator;

d) placing a (K-K) consistent oscillator which begins at a

wavelength at which the just centrally prior (K-K) consistent oscillator peaks and ends one wavelength range ~~segement~~ segment length therefrom and having a peak midway therebetween;

e) performing a fit to the imaginary part of the dielectric function data over said wavelength range ~~segements~~ segments which are fitted with (K-K) consistent oscillators, such that oscillator defining parameters in the (K-K) consistent oscillators are evaluated;

such that at each wavelength over the determined range of wavelengths the sum of the contributions of each evaluated (K-K) consistent oscillator approximates the magnitude of the imaginary part of the dielectric function.

ON PAGE 16, IN THE PARAGRAPH BEGINNING AT LINE 10, PLEASE ENTER THE FOLLOWING AMENDMENTS:

It is noted that said alternative procedures could involve selecting the wavelength range ~~segement~~ segment length to be the entire wavelength range, and involve use of only one centrally placed oscillator. Further, it could involve use of three, or five etc. odd number oscillators. If fact, a procedure could be to begin with say one oscillator and perform a fit, and see if the fit is good enough. If not, additional wavelength range ~~segements~~ segments and oscillators can be added until a fit results in acceptable results.

ON PAGE 21, IN THE PARAGRAPH BEGINNING AT LINE 26, PLEASE ENTER THE FOLLOWING AMENDMENTS:

As regards application in the presently disclosed invention, it is important to realize that use of 983 Oscillator Structures can be difficult in conventional fitting precedures which require

appropriate positioning of Oscillator Structures. The present invention overcomes this difficulty by simply defining ~~segements~~ segments in an (e2) plot, and mechanically assigning an oscillator which has definite beginning and end points structure in each.

ON PAGE 41, IN THE PARAGRAPH BEGINNING AT LINE 11, PLEASE ENTER THE FOLLOWING AMENDMENTS:

It is noted at this point that Fig. 6 demonstrates typical Conventional application of the 983 Patent Oscillator Structures to model Dielectric Functions. Such conventional practice strives to obain good fit with a minumum of Oscillator Structures, each of which has an effect over a fairly large energy range and can be difficult to apply, even for experienced practitioners. In comparison, as will be discussed with respect to Figs. 7 - 8e, the presently disclosed invention makes use of a multiplicity of short-energy-range effect oscillator Structures to the end that the imaginary part of a Dielectric Function is effectively modeled as a sequence of line ~~segements~~ segments between adjacent Oscillator Structure Peaks, the shape of said line ~~segements~~ segments each being determined as a sum of the Oscillator structure components present between said adjacent peaks.

ON PAGE 42, IN THE PARAGRAPH BEGINNING AT LINE 33, PLEASE ENTER THE FOLLOWING AMENDMENTS:

Figs. 8c and 8d demonstrate application of the method of the presently disclosed invention. Fig. 8c shows a first Oscillator Structure (OS1) applied to fit a left-most portion of a shown imaginary part of a dielectric part (e2), and Fig. 8d shows first and second Oscillator Structures (OS1) applied to fit a bit more

of the left-most portion of said shown imaginary dielectric function part (e2). (Note, the procedure could have been started at the right side of the plot and remain within the scope of the disclosed invention). In practice the first Oscillator Structure (OS1) is fit to the data, typically via a point-by-point square error reducing procedure. This is followed by adding the Second Oscillator Structure (OS2) as shown in Fig. 8b, and again performing a fitting procedure which evaluates parameters in said second oscillator structure (OS2) and simultaneously re-evaluates parameters in the first Oscillator Structure (OS1). Fig. 8e demonstrates a result where the point-by-point procedure indicated by Figs. 8a and 8b is continued over the entire energy range. Note that Fig. 8e assumes that equal energy (ie. wavelength), range ~~segement~~ segment steps are used for all oscillator structures. It can be observed that this leads to error in peak regions. A modified approach is demonstrated in Fig. 8f, and provides for using variable length wavelength range ~~segements~~ segments, specifically note the use of smaller energy steps in peak regions. Again, as Oscillator Sturcture are added a fitting procedure is again performed which evaluates parameters in an added oscillator structure and simultaneously re-evaluates parameters in the previously evaluated Oscillator Structure(s).

ON PAGE 44, IN THE PARAGRAPH BEGINNING AT LINE 5, PLEASE ENTER THE FOLLOWING AMENDMENTS:

Figs. 8g - 8j demonstrate that the approach to assigning oscillator structures can involve beginning at a central location and specifying some number of ~~segements~~ segments. Fig. 8g speficies one ~~segement~~ segment, while Figs. 8h and 8i specified two and four equal length ~~segements~~ segments respectively. Fig. 8j shows five specified ~~segements~~ segments, wherein the last two are shorter than the first three. Note that where two ~~segements~~ segments are specified, three oscillator structures are present.

Fig. 8i shows that where four ~~segements~~ segments are present, seven oscillator structures are present and Fig. 8j shows that where five ~~segements~~ segments are present nine oscillators are present. This occurs based on the method of positioning the oscillator structures such that sequentially, each successive oscillator structure begins where the just prior oscillator structure peaks. Typically global fitting will be applied in such a scenario.

ON PAGE 44, IN THE PARAGRAPH BEGINNING AT LINE 21, PLEASE ENTER THE FOLLOWING AMENDMENTS:

Fig. 8k shows use of one Gaussian or Narrow Lorentz (G or L), five Triangular (T), and two Modified Triangular (T') (T'') shaped Oscillator Structures. Note that Modified Triangular Shaped Oscillator (T') includes Discontinuies (UDISC) (LDISC), and that Modified Triangular Shaped Oscillator (T'') is constructed from a polynomial (F1) and a straight line ~~segement~~ segment (F2). Fig. 8 is included to demonstrate that while triangular (T) shaped oscillators are preferred, the present invention methodology allows for use of different functional Oscillator Structures in modeling a dilectric function. A requirement of all Oscillator Structures is, however, that definite start and end point intersections with the horizontal axis must be identifiable so that generally the start and end points of one oscillator can be positioned directly beneath the peak of the Oscillator Structures directly adjacent thereto. It is pointed out that the start and end of the first and last Oscillator Structure, of course, have no adjacent Oscillator Structure peak positioned thereabove.